121 the organization of the empire, based fundamentally on the tribute of groups not related to the dominators. These are very extensive parts of the social organization of the Tenochcas, and very important; but they can be left aside in treating our problem because they can be considered surely as forms derived from a fundamental structure. Nor is the attempt made in this work to describe all the functioning of the Tenochca society, nor to discuss all the positions which have been adopted with respect to various particular aspects of their social organization: these are so many and so intricate that the discussion would constitute many works such as the present; only a few have been dealt with, those which appeared to me relevant to the discussion of the central theme. Thus this work is limited to elucidating if there were clans among the Tenochcas and what were the characteristics of the social classes. In Part I is an exposition of the data which have permitted certain investigators to think /p. 19/ that the Tenochcas had social classes. In Part II an attempt is made to demonstrate that in Tenochca society there existed an organism based on kinship through common descent, an ambilateral clan, by nature clearly stratified: the calpulli; and that the phenomena which might lead us to think that the society of the Tenochcas had classes are explained by the existence of groups of this type.

●127 The sources consulted to obtain data which would serve as the basis for my conclusions are practically the same as those utilized by Bandelier and by Moreno, M., to which are added a few more items furnished later to investigators. The sources consulted naturally are very many more than the sources used and cited, for actually there is an enormous lack of data with respect to the problems which I treat in this work. Data from other regions had to be utilized (Tlaxcalla, Texcoco, for example) in order to complement certain information, and it was necessary to utilize data from very much later periods than the one whose reconstruction is attempted in this work; but this was impossible to avoid. In order to standardize the criterion regarding the validity of information, I regarded the documents immediately after the conquest of Mexico as describing the situation with some errors: (1) The limitations of inquiry and information, stemming from the fact that neither the chroniclers nor the informants had special training; (2) the stress given certain subjects by the way the informants or the recorders saw them, according to their interests; (3) the difficulty that the Spanish had in understanding a society so different from their own in some respects and so similar in others; (4) the difficulty the informants had in analyzing their own society. The

●127 majority of the data which could not be considered as a result of Spanish influence were taken as remains of situations from before the Spanish conquest. In every case the principal criterion of accuracy was the congruity presented by the data themselves; particularly in the sifting of data in works written long after the conquest or by authors who did not come to Mexico in this period (Acosta, Torquemada, Clavijero, Gómara, etc.) but who had at hand information and documents which we now lack, or who saw remains still little modified of the ancient social organization of Tenochtitlan.

The contorted form reflected by some arguments derives principally from the necessity of taking advantage of the few facts about the subject, which are not always specific or categorized, but which refer to secondary or derived cultural traits; and which suggest a prior basic situation necessary to their appearance.

/p. 21/ THE IMPORTANCE OF THE CALPULLI

/p. 23/ Chapter 2

SOCIAL STRATIFICATION

565 463 In the sources for the history of Mexico we find data which beyond doubt demonstrate the existence of social stratification among the Tenochcas and which have let a few authors think that the Tenochcas had social classes. These data are very diverse in nature and very abundant, but here only the more significant will be presented: the division between manual laborers and directors, the paying of tribute, the differentiation in the living standard, the relation between the strata and the calpullis, and the inheritance of property to a determined stratum.

With respect to the division of labor we find a great difference of activities between two types of people: those who undertook manual labor and those who undertook essentially directive tasks. We are told that the macehuales were the common people and laborers (1) and that

1. Zurita, p. 94.

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

HISTORICAL GEOGRAPHY

121 It would be too much to pretend that the high cultures of Middle America depended on lakes for their development, but lakes are of extreme importance to domestic economy wherever they exist, and the role they have played in shaping culture has not been insignificant. The lakes of Mexico and Central America have not only played this role to a degree that is out of the ordinary, but they are part of a scene that has no parallel, either in importance or in drama, in the entire history of western culture. New lands and strange peoples had been discovered before 1519, and the astonishing fact of the existence of "primitive" societies was not at all new to western thinkers who had read Herodotus. What the 16th-century Spaniards found in Middle America, however, was something altogether new and totally unexpected: a new civilization, with all that the term implies. The Aztecs and the Mayas lived in cities, and performed great engineering feats; they had a developed art and literature, and a body of scientific knowledge at least as well founded as that of Egypt; their scholars were interested in history, and demonstrated in elaborate ceremonials a philosophy that was highly sophisticated (repellantly so to the Spaniards, of course) on the theological side.

The impact of these facts was quickly muffled by Spain's closed-door policy for the Indies, and dwindled almost to nothing in the exciting centuries that followed the Spanish Conquest. It is only in our own day that the full meaning of the Middle American civilization is becoming apparent, and historians, aware of the powerful tool that the comparative method provides, have seen the necessity of comparing *independent* civilizations and the cultural lineages that produced them. Such a comparison is the best way, perhaps the only way, to deduce laws of societal evolution, and Middle America provides the only phyletic series of cultures outside the Old World that was independent enough, and progressed far enough, to be useful.

121 127 An investigation of the history of Mexican limnology (and the

[p. 220]

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

limnology of Mexican history) has a small but not negligible part to play in the writing of the general history that is needed. In what follows we present some notes on the subject, but it has to be said at once that the state of scientific knowledge among the aboriginal Middle Americans can probably never be satisfactorily appraised. The reason is, of course, that most of the written sources have disappeared. Only a handful of genuine pre-Conquest manuscripts have been preserved, while many are known to have been wantonly destroyed as heretical. Copies of some of them, probably fairly accurate copies in some cases, were made shortly after the Conquest. Numerous histories were written by learned and intelligent friars, using these documents and other sources of information that have since disappeared in their turn. For some purposes, as for reconstructing tribal movements and genealogies, particularly those within a couple of centuries of 1519, it matters little that the records are copies, as Radin (1920) has shown. The events they show are real enough, and their historicity has in general been confirmed by archaeology. For events that were more remote in time and space from the memories of the educated natives who set them down, the validity of the records is highly problematical, and the documentary history of Toltec times is "una inextricable maraña", as Mendizábal (1947) called it.

Ideas are much easier to garble than events, and the reconstruction of Middle American science involves a distressing amount of that sterilizing activity, the history of historiography. That is, confronted by the fact that the native ideas have filtered through the minds of Europeans, we must investigate the quality of those minds before we can get on with the subject. This difficulty is particularly apparent to the historian of limnology, in that the earlier writers were singularly uninterested in lakes and ill-informed about them. No doubt this is because they came from Spain, the one country in Europe that is least likely to have produced a limnologically minded historian. Whatever the reason, the data reported below are as fragmentary as they are fascinating. At most one can hope to have it said, as Prescott (n. d.) said of Veytia, "Every page bears testimony to the extent and fidelity of his researches; and, if we feel but moderate confidence in the results, the fault is not imputable to him, so much as to the dark and doubtful nature of the subject."

AZTEC LIMNOLOGY

For knowledge of limnology among the Aztecs, as for all matters concerning Aztec customs and beliefs, one turns first to the great *Historia general de las cosas de Nueva España*, by the Franciscan friar

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

127 Bernardino de Sahagún (1499–1590), who came to Mexico in 1529. It is unfortunate that there is still no complete edition of this work in a European language. The Spanish version, written by the author toward the end of his life, was not published until the early 19th century, and is in part a condensation of the Nahuatl work written about 1547. This is particularly true of Book Eleven, which contains most of the natural history, and has therefore attracted less attention from scholars than the books dealing with ceremonies and the calendar. The edition by Anderson and Dibble (1950–54), which gives Nahuatl and English in parallel columns, has not yet reached Book Eleven, so we must rely on the 1938 Robredo edition of the Spanish text, while the illustrations
127 are to be found in the Madrid edition of 1905–07. Sahagún's vertebrate
136 zoology has recently received careful treatment at the hands of Martin del Campo (1938, 1940, 1941). Some of the flavor of his ornithology can be given by "listening to the mockingbird" (actually the curved-bill thrasher, *Toxostoma curvirostre)* when he sings in Nahuatl:

"There is a bird in this country called *cuitlacochtótotl* or *cuitlacochin;* it has longish and slender feet, and a thin and sharp beak, somewhat
[825] curved; it is of a muddy color, tending toward purplish; it sings very well; it is so called by reason of its song, which says *cuitlacoch, cuitlacoch, taratitarat, tatatati, etc."* (Robredo edition, vol. 3, p. 189).

127 Sahagún's botany will not be discussed here, since it appears not to bear significantly on limnology. It is treated from the medical point of view by Alcocer (1938) in an appendix to the Robredo edition. Aztec medical botany, however, is much more thoroughly covered in Emmart's magnificent edition (1940) of the de la Cruz-Badianus herbal of 1552, and in a memoir by Paso y Troncoso (1886), while Sahagún's general botany is competently treated by Rivera (1941).

A general impression of Sahagún's work is that it is the achievement of a man who knew no natural history when he came from Spain, but whose consuming passion for all things Mexican drove him to learn and record all he could from native informants. If so, we are entitled to read between the lines an enormous amount of information that was not recorded. It is of course no new discovery that "primitive" people are very skilful naturalists. Raymond Paynter informs me that more kinds of Yucatecan birds are named in modern Maya than in Latin, and ethnographers have repeatedly found natives to be better naturalists than themselves. This does not diminish the fact that the lacustrine flora and fauna were exceedingly well known to the Aztecs of the Valley of Mexico, many of whom spent most of their lives in canoes and depended on limnologic knowledge for their livelihood. And, though the available sources emphasize the economic basis of this knowledge, so that "comenlos"—"they eat them"—is a monotonous refrain in

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

Sahagún, it does not follow that Aztec limnology was exclusively motivated by exploitation. Scientific curiosity in the modern sense was not a dominant quality of 16th-century Spain, and the stress on practical matters is at least as likely to be a property of the Spanish as of the Aztec mind. Moreover, as Maldonado-Koerdell (1946) points out, an essential basis of Aztec interest in natural history, at least in vertebrates and plants, was magical and totemic. 127

FAUNA. It is characteristic, and exasperating, to find that Sahagún's Chapter 12 "De las diversidades de las aguas" discusses the sea, the rivers, and the springs, and omits the lakes. A much more impressive amount of limnologic information is given in Chapter 2, with its list of 41 aquatic birds, practically all of which can be identified (Martin del Campo, 1940). Nahuatl names and brief descriptions are given, but what is more important is that food habits are listed for nearly every species, and that most of them are illustrated. Chapter 3 deals with aquatic animals, including crustaceans, turtles, amphibians (including the axolotl), the marine iguana, and a disappointingly short list of fishes. Crocodiles are separated off with several mythical water creatures in Chapter 4, "De otras animales del agua que no son comestibles". Since Sahagún wrote in the century of Gesner, we need not be surprised to find a certain amount of credulity displayed; the account of the *yacapitzauac* or *nacatzone*, a bird (the eared grebe, *Colymbos nigricollis californicus*) that subsists on its own feathers, is particularly enchanting. 127 136

Fishing on Lake Texcoco is probably not what it was before the Valley lakes were finally lowered in 1900, but statements that the salt lake is lacking in fishes are erroneous. At the time of the Conquest, the Anonymous Conqueror remarked "in the sweet water there are some small fish; in the salt part they are still smaller" (1917 edition, p. 59). Cortés, on the other hand, tells us that the fisheating birds in Montezuma's menagerie were fed daily on two hundred and fifty pounds of fish, caught in the salt lakes (MacNutt edition, 1908, vol. 1, p. 266). The two statements do not conflict, since small but numerous members of the families Atherinidae and Goodeidae were doubless the staples of the fishery. The aboriginal methods of fishing may be seen within a few miles of Mexico City today, as Linné shows (1937, 1948). All are illustrated in the Florentine Codex, i.e. the work of Sahagún, and in the fascinating pictures that decorate the mid-16th-century map "attributed to Alonso de Santa Cruz", now in the library of the University of Uppsala. This map serves as the focal point of Linné's remarkable book (1948), which synthesizes archaeologic, historic, and ethnographic knowledge into a convincing picture of the Valley of Mexico in 1550. 127 136 226

The fishing methods include rod-and-line, nets of two of three sorts, 226

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

●127 and spearing. It is not certain that the rod-and-line method involved
226 fishhooks, for these are not known archaeologically from the Valley, but the line may have carried a gorge instead of a hook, and in any case *golden* fishhooks were found in use in 1518 by Grijalva on the island of Cozumel. The types of nets used are the gill net, the pole net, and possibly the throw-net; the latter was used for rabbits but may not have been used for fish. Spearing is of particular interest to ethnologists, because Mexico is one of the few places in the world where the atlatl is still in use. This fact was discovered on Lake Pátzcuaro by Seler in 1892 and on Texcoco by Beyer in 1925.

127 Water birds are mainly hunted in the fall and winter, when migrants
223 swell their numbers. On Pátzcuaro the Tarascans surround them with canoes and kill them with tridentiform atlatls, as described by León (1934) and Foster (1948), but in the shallower lakes of the Valley the birds are caught in long nets stretched just above the water. This practice is fully depicted in the two 16th-century pictorial sources, and survives today (Linné, 1940).

127 Exploitation of the Valley lakes for animal food was not restricted
262 to fishing and fowling. If it had been, we should have no reason to impute any special limnologic knowledge to the Aztecs, but the use they made of their lacustrine environment goes far beyond that of the usual "primitive" society. In addition to tadpoles and frogs, and the axolotl, of which Sahagún says "es muy bueno de comer; es comida de los señores", the historian lists a number of invertebrate foods in Chapter 3. These items of diet have bewildered most subsequent writers, and without a thorough ethnographic survey it is impossible to be sure that the following remarks are not compounding the confusion. However, there are certain points that a limnologist finds obvious and that have been missed by all the authorities. In discussing the invertebrates we rely not only on Sahagún and the relevant illustrations in Plate I, but on Hernandez' *Historiae animalium et mineralium Novae Hispaniae liber unicus*, written in the 1570's and appended to the 1651 Rome edition of the great work on Mexican medical botany.[2]

127 [2] Mrs. Emmart, in her edition of the de la Cruz-Badianus herbal (1940), remarked that the five copies of Hernandez' work that she was able to collate are all of different editions, though all bear the year 1651. Presumably these all have the title *Rerum medicarum Novae Hispaniae Thesaurus*, but the copy in the Yale University Library, also imprinted 1651, is entitled *Nova plantarum, animalium et mineralium Mexicanorum Historia*. In any case this is a very incomplete version of what must be the greatest work on Mexican natural history ever written. Hernandez' Latin work ran to 15 or 17 volumes, and is believed to have been destroyed in the fire at the Escorial in 1671. George Kubler informs me, however, that a Nahuatl translation was made by 1576, and this or a copy of the original may yet come to light.

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

The most famous of the edible invertebrates is the *axayácatl*, referred to as *axaxayácatl* by Sahagún and Hernandez. Although modern writers (Vaillant, 1941; Apenes, 1943; Linné, 1948; Anderson and Dibble, 1954) persist in calling these insects flies, it has been known for more than a century that they are corixid waterbugs. Sahagún's Spanish word was *coquillo*, not *mosco* or *mosquillo*, so the confusion is not his fault. In post-Conquest times the dried adult insects have been widely sold in the markets of the world as food for caged birds, but they were also used as human food; Hernandez says that they were cooked in maize leaves in nitrous water. Hernandez also makes it clear that these insects are the source of *ahuautli*, a cake made from the eggs that is still much eaten in Mexico, particularly on watch-nights such as Christmas Eve and Holy Thursday. That *ahuautli* was formerly a staple that survives as a delicacy is suggested by its name, which is derived from *atl*, water, and *huautli*, amaranth seed. Now that Sauer (1950) has cleared up some of the indescribable confusion surrounding the use of grain amaranths in aboriginal Mexico, we can begin to appreciate that *ahuautli* was really "water grain", though not in the literal sense of "water wheat" implied by Tylor (1861), whose etymology has confused such later writers as Packard (1871). The identity of the insects is an equally tangled bibliographic problem in which the zoologists have hardly been more helpful than the historians.

The fullest and most authoritative-sounding account is that of Orozco y Berra, given in his memoir on the hydrography of the Valley of Mexico (1864). This historian quoted in full de la Llave's description (1832; reprinted 1887) of the adult insect under the name *Ahuautlea mexicana* (which appears to be the correct name, though it has been ignored by zoological writers; it has priority over the generic name *Krisousacorixa* Hungerford 1930 and the specific name *Corixa femorata* Guérin-Meneville 1857). He described the cultivation of *ahuautli*, which is accomplished by placing bundles of *tules* (*Scirpus* or *Typha*) in the water of Lake Texcoco, stripping off the eggs which the insects lay in countless millions, and processing them into cakes. This much of Orozco y Berra's work is correct; it is fully confirmed by the modern observations of Ancona (1933), and, if there is any doubt that the practice is an aboriginal one, the doubt is removed by Sahagún's figures, reproduced in Plate I, nos. 220–221. Professor Hutchinson assures me that no. 220 is certainly the oldest known figure of a corixid waterbug. Oddly enough, Sahagún does not describe the practice or mention *ahuautli* with the edible insects in Book Eleven, though he lists it among the products sold in the market in the 19th chapter of Book Eight. Hernandez repairs the omission.

Ancona's account (1933) is the only one by a modern zoologist, and

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

●127 136 suggests that the *axayácatl* is ordinarily *Krisousacorixa azteca* Jaczewski, 1931; it may also be *K. femorata* (Guérin-Meneville, 1857), while *Corisella texcocana* Jaczewski and *C. mercenaria* (Say) may be less important components of the market product, along with the backswimmer *Notonecta unifasciata* Guérin-Meneville. Which species contributes most eggs to *ahuautli* is not made clear even by Ancona's paper, although it is certainly one of the species of *Krisousacorixa*.

Unfortunately Orozco y Berra went on to confuse the issue by discussing the *cuculin*. This word does not occur in Sahagún's text, so far as I have been able to discover, though it is mentioned by Hernandez, by Alvarado Tezozomoc (Orozco y Berra's edition, p. 236), and by Pomar in his *Relación de Tezcoco* (García Icazbalceta's edition, 1891, p. 59). Orozco y Berra considered it to be composed of "nests" of the "larvae" of the *axayácatl*, which come to the surface under circumstances unknown and are scooped from the water and made into cakes. The "larvae", furthermore, are said to be eaten as *puxi*, so that the miraculous corixids are eaten in four different forms under as many names. Corixids, of course, have neither larvae nor nests, and it appears that Orozco y Berra attributed to the *axayácatl* some of the properties of the insect products *cuculin* and *izcauitli* and of the vegetable product *tecuitlatl*. I have not traced the word *puxi* back of Orozco y Berra, but the *cuculin* and the *izcauitli* appear to be pupal and larval stages, respectively, of a salt fly, probably *Ephydra hians* Say. Sahagún describes the *izcauitli* as having "no head, but two tails, and reddish", and the featureless animals shown in Plate I, no. 223, certainly do not disagree with that description.[3] At the risk of introducing still another false etymology I suggest that the name itself has something to do with salt, *iztatl*, but in any case Pomar's description, in the *Relación de Texcoco*, written in 1582 and published by García Icazbalceta in 1891, leaves little doubt that a salt fly is meant: "There grows another sort of food called *ezcauhtli*, which is made of certain little grubs like earthworms, so slender and so pullulent in their multitude and density, that one can scarcely judge whether or not the substance is alive" (p. 59). Salt-fly larvae are almost the only grubs that would occur in such quantities in

[3] In the original codex (of which there is a photostatic copy in the Yale library) the illustrations are interlarded with the Spanish text, and not separated as in the published editions. This arrangement is of little help in identifying the animals, as the association of pictures and text appears to be arbitrary, probably through the copyist's mistake. Thus, while Figure 223 stands with the *ocuiliztac*, making it conceivable that this, and not *izcauitli*, was Sahagún's word for Ephydrid larvae, Figure 220 stands with *amenezili*. The subsequent paragraph on *axaxayácatl* contains Figure 221, making it clear that the location of Figure 220 is a mistake.

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

a salt lake, and Aldrich (1912) gives a graphic account of *Ephydra gracilis* Packard on the Great Salt Lake, Utah, and of *Ephydra hians* on Mono Lake, California. The latter are not only collected in quantity and eaten by Paiute Indians, but were bred out of supposed "larvae" of the *axayácatl* of Lake Texcoco by Peñafiel (1884) and identified by Williston, who referred to Peñafiel's specimens in 1883 and again in 1896. Even Ancona overlooked the fact that Peñafiel's larvae could have nothing to do with a corixid, so that Aldrich's remark, "it seems that the Diptera and the Hemiptera are mingled together in the quotations", is an understatement.

The pupae of ephydrids come to the surface and undergo mass emergence, and it is then (in September) that they are collected and processed as *Kootsabe* by the Paiutes of Mono Lake. In all probability this is the product that the Aztecs called *cuculin*. (The words sound distantly related, which is not inconceivable, as Paiute is a member of the Uto-Aztecan linguistic group). The substance is definitely confounded with *tecuitlatl* by Orozco y Berra, however, and the suggestion that it is made of the pupae of *Ephydra hians* is made with due hesitation. As Aldrich said, "only an investigation by an entomologist at the lake can clear up the confusion" (1912, p. 92). Though Sahagún does not mention *cuculin*, nos. 224 to 227 in Plate I appear to depict stages in its manufacture, or in the collection of the larvae, *izcauitli*.

The puzzling stuff called *tecuitlatl* is mentioned by Sahagún in Book Eight, and listed (as *tecuiltlatl*) with the lower animals in Book Eleven. He describes it as "*urronas*" ("*urrosas*" in Lord Kingsborough's edition (1831–48), but neither form occurs in any dictionary I have consulted nor does my own reading "orroras") which grow on the water, have a purple color, and are harvested, dried on mud, and made into cakes. Anderson and Dibble translate the Nahuatl word as "scum", and the material is probably algal. Pomar (García Icazbalceta's edition, p. 59) refers to it as "green sheets that grow, which, when made into a cake and baked, take on a dark green color, and which the Spaniards call *queso de la tierra*". Hernandez, who lists it among the minerals, confirms the purple or green color ("color adhuc recenti cyaneus, aut viridis"). López de Gómara, who was never in Mexico, but who published in 1552 a delightful book on the Conquest that has been a best-seller for four hundred years, adds the suggestive detail that the substance (which he does not name) was gathered on "threshing floors" (*eras*) like those in which salt is made. He said that it is eaten as we eat cheese, and described its flavor as salty, but very good with *chilmolli* (1943 edition, pp. 238–239); continuing with the sonorous text of the first English edition (1578, reprinted in facsimile 1940) from

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

which the above details are omitted, "yea, and they holde opinion that this skume or fatnesse of the water, is ye cause that such great number of foule cometh to the lake, which in the winter season is infinite."

Linné (1948), who considers that the substance was an alga that is no longer used, identifies it with the cakes that Bernal Diaz del Castillo saw being sold in the market at Tlatelolco, and which he described as having a cheeselike flavor (1928 edition, p. 300). It is not improbable that Diaz' cakes were made of corixid eggs, *ahuautli*, and it is conceivable that Sahagún's substance was also, though the reference to purple color makes it unlikely. If purple *Oscillatoria* or *Nostoc* were used as food at the time of Conquest, they are doubtless so used today, but the scene of the harvest may be expected to have shifted with the changing salinity of the Valley lakes and the decline of native salt manufacture.

The remaining invertebrates on Sahagún's list have drawn no attention from historians, and, possibly for that reason, they can be identified with some confidence. The *acocili* is clearly a crayfish, presumably *Cambarellus montezumae* (Saussure), and this is the modern Mexican name for that animal (DeBuen, 1944 a; Villalobos, 1943). Sahagún distinguishes it from the *camarón*, or shrimp (*Macrobrachium* or *Palaemon*), and discusses the latter in another part of the chapter, though without giving its Nahuatl name. Plate I, no. 219, leaves no doubt of the identification. In that figure it is accompanied by a dytiscid beetle larva, and this is presumably the *oculiztac*, which are "muy ligeros en el agua". Finally, the *anenezili*, which "turns into those bugs (*coquillos*) that have four wings and fly, and are called hawks (*gavilanes*) in Castile", is almost certainly a dragon-fly larva (Odonata). No. 222 in Plate I appears to represent the adult.

One point should not escape notice, in this melancholy record of confusion: four centuries of scholarship have not sufficed to bring limnologic knowledge of the Valley of Mexico up to the stage attained by the Aztecs and used by them in their daily lives.

CHEMISTRY. An inorganic product of the lakes that was also fully exploited was salt. Ethnographic data on saltmaking have been collected by Apenes (1944), and the importance of salt in aboriginal economy has been extensively discussed by Mendizábal (1929; reprinted in the *Obras Completas*, 1946). The latter author points out that evaporation by artificial heat is a practice introduced by the Aztecs and other high cultures of the highlands, and that the archaic method of solar evaporation survives in those areas less subject to Aztec domination. A standard feature of the more sophisticated method is the separation of silt by settling and filtration from the water to be evaporated, and today

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

the salt is commonly extracted from soil of several types rather from the water itself. This practice would be expected to arise in a country of inland salines, not along the seacoast. Moreover, fractional evaporation is used to give different products, according to Apenes, the last of the liquors being the source of saltpeter. We cannot yet be sure that the whole complex is pre-Cortesian, but it suggests a knowledge of limnologic and soil chemistry among the Aztecs that was at least as great as their ceramic and metallurgic skill would imply.[4] The point is not only of considerable importance, but is capable of verification by chemical archaeology; that no attempt to do so has been made so far is another indication that the scientific knowledge of non-Western peoples exceeds in some respects that of the historians and ethnographers who study them.

Salt is one of the seldom-considered essentials of human welfare. Mendizábal makes the provocative point that if the Aztecs had been more generous with their salt, the Tlaxcalans (who had no salines in their domain) might not have been so ready to ally themselves with Cortés, and the course of history might have been rather different.

HYDROGRAPHY. The demonstration that the Aztecs had detailed knowledge of all aspects of their lakes that might be used for human sustenance is not itself a proof that they had a developed limnologic science. Far more primitive people have known and done as much, and none of the practices mentioned, with the possible exception of fractional evaporation of salt water, are beyond the capabilities of the Banyoro, for example, who live on Lake Albert in Africa (Worthington and Worthington, 1933). The urbanization of Tenochtitlán, however, brought problems in its train that simpler societies could hardly have faced. Lake *villages* are known all over the world, but lake cities are much less usual. In meeting these problems the Aztecs and their

[4] A piece of chemical knowledge that has been entirely overlooked is the manufacture of some salt from urine. Bernal Díaz del Castillo (1910 edition, p. 72) mentions the sale of "many canoes full of human excrement, and these were kept in the creeks near the market, and this they use for making salt or tanning skins, for without it they say that they cannot be well prepared". The reference to tanning of skins shows clearly that the excrement was urine and not feces, for the tanning properties of uric acid are still taken advantage of in modern Mexico; moreover, Bernal Díaz goes on to describe the collection of feces and their use as fertiliser. What "salt" other than uric acid or sodium chloride could have been extracted from urine is problematical; nitrates would have been the most valuable, and they could conceivably have been separated from the chlorides by fractional evaporation, as in the case of salt water. In the history of western chemistry the most important salt found in urine was microcosmic salt, $NH_4\ NaHPO_4 \cdot 2H_2O$, which served Brand as the source of phosphorus.

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

neighbors demonstrated practical control over the lacustrine as well as other components of their environment.

At the time of the Conquest, according to extensive researches summarized by Orozco y Berra (1864), Maudslay (1908, 1910, in the 2nd and 3rd volumes of the Hakluyt Society edition of Bernal Diaz del Castillo), and especially by Schilling (1939) and Linné (1948), the Valley lakes were more or less one continuous sheet of water. Schilling's series of sketch maps is reproduced in Figure 1. Cortés, in his second letter to Charles V (MacNutt edition, 1908, vol. 1), speaks of two lakes, because Lake Texcoco, the lowest-lying and most saline body of water, was separated from the freshwater portions by a great dike, the *albarradón* of Nezahualcóyotl. The Valley lakes of course were without outlet to the sea, and the drainage operations that began in the late 16th century and were made effective only in 1900 were devoted to the northward diversion of Lake Zumpango, regarded as the source of the most dangerous floods, to the Río Tula. The 16th-century historians believed that Texcoco had a subterranean outlet to the sea by way of a spring in the valley of Tula. Pomar (García Icazbalceta's edition, 1891, p. 58) claimed to have seen it, while Sahagún (Robredo edition, vol. 3, p. 298) described the "whirlpool" in the center of the lake as the scene where small boys were sacrificed every year. It is reasonable to suppose that the legend of the outlet was believed by the acculturated Indians, but it does not follow that the educated Aztecs believed it.

The "Lake of Mexico" of the historical sources is usually the freshwater part that surrounded the Aztec capital, Tenochtitlán. This part is now dry, as is the southernmost lake of Chalco. Dikes that served as causeways connected Tenochtitlán with the mainland, but the most important dike from the hydrographic standpoint was that of Nezahualcóyotl, which lay to the east of the city. According to tradition, the dike was built by the king of Texcoco in 1446, during the reign of Montezuma I. It was 16 km long, and required the labor of 20,000 men. The reason given for its construction was to protect the Aztec capital from floods, though it is not clear why a Texcocan king should have contributed so generously to his rival's advantage. Of the advantage, however, there can be no doubt. All of the southern valley floor, from Chalco to Tenochtitlán, was doubtless covered with *chinampas*, the artificial islands that have been called "floating gardens" since the days of the imaginative 18th century historian Clavijero. Floods along the course of this drainage would on the whole have been beneficial, though inconvenient; the real danger threatened from the Texcoco side, whence salt water, driven by freshets or seiches,[1] might disastrously drown the *chinampas*. Freshets, that brought large river fish through

[1] [i.e., an oscillation of the surface of a lake lasting from a few minutes to several hours, thought to be due to inequalities of atmospheric pressure. – Analyst]

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

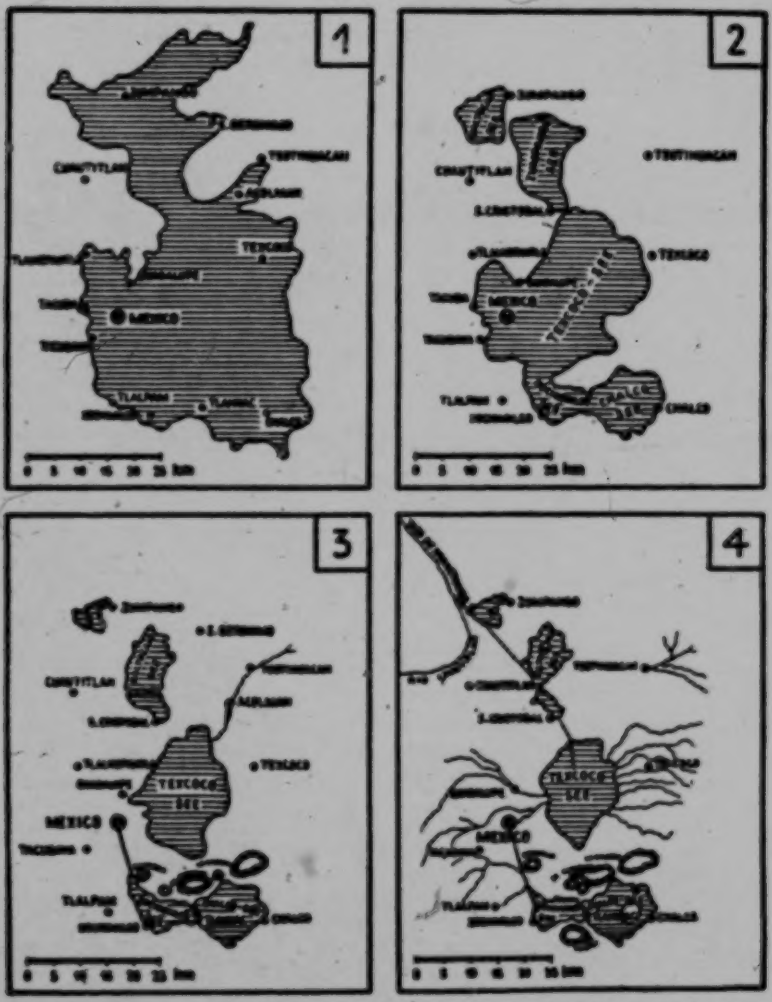


Fig. 1. Sketch maps of the lakes of the Valley of Mexico, (1) during the Ice Age, (2) at the beginning of the 16th century, (3) at the beginning of the 19th century, (4) in 1889. Reproduced from Schilling (1939).

the salt lake from the streams on the eastern side of the Valley, were described by Motolinía in 1540 (Steck edition 1951, p. 263). That seiches also occurred may be inferred from Cortés' reference to "tides" (MacNutt edition, 1908, vol. 1, p. 256). Moreover, Sahagún records in Book Eight a tradition, regarded later as an omen of the coming of the Spaniards, to the effect that "the water of the lake foamed up, and

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

127 133 731 the wind did not stir it up. It was as welled up .... and it reached the lower parts of the houses" (1954 edition, p. 18). There appear to be no modern observations of seiches, but the extraordinary Gómara remarks (1940 edition, pp. 195–196) that "the salte water ebbeth and floweth, accordyng to the wynde that bloweth".

127 312 Whether irrigation was practiced in Middle America is a question that has never been adequately considered (Millon, 1954; Palerm, 1955). Clearly it would not have been necessary in Aztec times in the Valley of Mexico; *chinampa* agriculture, which substituted for irrigation, has an ancient history in the Valley (Apenes, 1943), but it is not known elsewhere nearer than the Vale of Kashmir (West and Armillas, 1950). At other times and in other places it seems certain that the dense population could not have been maintained without irrigation. The great ceremonial center of Teotihuacán lies in a subdivision of the Valley that receives less precipitation than Mexico City, and some irrigation is practiced there today. We know from the work of Apenes (1943) and Sears (1952) that just prior to Teotihuacán times (about 500 B. C.) the Valley lakes were appreciably lower than today, and the conclusion is inescapable that Teotihuacán culture was founded on high ground and flourished during a dry time when irrigation must have been essential. Deforestation (Vaillant, 1941) complicates the hydrographic picture for Teotihuacán times but it is evident that the rise and spread of Aztec culture was related to increased moisture, reflected in high lake levels during the 14th to 16th centuries. The high levels would doubtless have continued through the 18th century, in agreement with climatic oscillations elsewhere, if sporadic attempts to drain the Valley had not been partially successful in the early 17th century (they were not completely successful until 1900).

Aztec control of hydrography, then, did not include irrigation where it was unnecessary, but was devoted, in the last centuries before the Conquest, to regulating the levels of the lakes. Before the Aztecs entered the Valley, however, they lived in many places, not all of 127 which were lacustrine. So far archaeology has made little progress in reconstructing the details of their history during the migration period. The problem is exceedingly complicated, and four centuries of scholarship have not made it less so. The Aztecs were interested in their own history, and attempted to draw it together in pictorial manuscripts. These have been lost, and what have come down to us are copies, made, probably from memory, by hispanicized Indians under the prodding of the 16th-century friars. In the interpretation and verbalization of these pictorial histories we have to contend with ideas implanted by the friars, and the result is a picture of the migration period that is strongly reminiscent of the wandering of the Israelites, joined to a

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

conception of city states within the Valley that owes much to the history of Greece and medieval Italy.

For the special purpose of this limnologic history, we need to wade into the "inextricable maraña" at only one or two points. On one point the sources, such as they are, are almost unanimous: there was a city called Tollán or Tula ("place of reeds" i. e. of *Typha*, the modern *tule*). Tollán is where the Toltecs came from, etymologically at least; the Toltecs were the predecessors of the Aztecs and the other Valley peoples, and were also regarded as ancestors by the Mexicanized Mayas of Yucatán, with whose tangled history we are fortunately not concerned here. The chief source of confusion, apart from the loss of the documents themselves, is the tendency, surely not a post-Conquest invention, for the relatively barbaric Valley people to identify themselves dynastically with the legendary founders of the civilization they inherited. The cultural picture is not an unfamiliar one, and probably was in actuality similar to that presented by the Etruscan foundations of Roman civilization; unfortunately, it comes to us on the testimony of friars who were only too well aware of such historic parallels, and could not refrain from asking leading questions. Be that as it may, Vaillant (1941), on the basis of archaeologic and historic researches, arrived at a satisfying conception of Aztec prehistory, in which the real and classic Tula (Tollán) was Teotihuacán, while memories of it played out their part in synthetic genealogies of "dynastic Toltecs", the chiefs of the wandering "Chichimec" tribes who entered the Valley after the decline of Tula in the 12th century.

Vaillant's picture was considerably upset by the excavations at Tula, Hidalgo (Acosta, 1940, 1941, 1944; see also Du Solier, 1941, and other papers in *Revista Mexicana de Estudios Antropológicos*, T. 5, no. 2–3, 1941). These showed clearly that Tula, not Teotihuacán, was the Tollán from which emanated the Mexicanization of Chichén Itzá. Thus Tula was the Mayas' Tula, but whether it was necessarily the Mexicans' Tula is not so easily admitted, and is still in sharp dispute. What interests us here is whether Tula was a lacustrine city, for Teotihuacán was not.

The Codex Ramírez, authoritatively regarded as a manuscript copy of the *Relación del origén de los yndios*, probably 1583–87, by the Mexican Jesuit Juan de Tovar (see Kubler and Gibson, 1951, for discussion), is one of several almost identical histories of the migration period from the Aztec (i. e. not from the Texcocan) point of view. It happens to be the only one of which a convenient English translation exists (Radin, 1920), and from it we quote the following account of Tula.

"The remainder of the community with their chief and their ark

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

●127 174 arrived at the town called Tula, quite diminished in numbers on account of the divisions that had taken place. There they remained some time, replenishing their provisions and increasing their number, living in a cerro called Cohuatepec, that is to say, the snake-mountain. Here, in dreams, their idol ordered his priests to deflect the water of a very full river that flowed through that region so that it might spread over the whole valley and then be brought to the middle of the mountain on which they were living, for he wished to show them the appearance of the land he had promised them. They constructed the dyke and the water spread out and extended over the whole valley, turning it into a very beautiful lagoon lined with willows, poplars, and sabines. In the lagoon grew many rushes and reeds, and on that account the place was called Tula, meaning the-place-of-the-rushes (*junca*) or reeds (*espadaña*).

"The place soon abounded in fish and waterfowl, such as ducks, herons, *gallareta* [coots], with which, together with many other species of birds, the entire lagoon seemed to be completely covered. And to the present day the lagoon of Mexico abounds in these animals.[8] The place was thickly covered with rushes (*carrizales*) and marine flowers, and inhabited by differently colored thrushes, some red, others yellow, which were accustomed to gather at the place and which harmonized with the songbirds in the trees, of which there were quite a number; all this making the place delightful and pleasant, and as such it was painted in their books.

"The Mexicans, quite oblivious to what their idol had told them, namely that this place was merely an imitation and pattern of the land they were to be given, stayed in this delightful place (a long time) and began to feel that it was quite satisfactory, some even saying that they desired to stay there permanently, and that this was really the place selected by their god Huitzilopochtli; that it was from that place that they were to follow their desires, being the rulers of the four parts of the world, etc.

"Their idol, seeing this, waxed so angry that he said to the priests, 'Who are these who thus wish to transgress and put obstacles in the way of my orders and commands? Are they perhaps greater than my-

[114]

[8] The *Crónica Mexicana* of Alvarado Tezozomoc (1598), another of this group of closely similar histories, is more explicit about these animals, listing frogs, *axolotl*, *camarón*, *axayácatl*, *izcauitli* and *tecuitlatl*, and adds that the Mexicans regarded the red *izcauitli* (identified above as Ephydridae, but possibly Chironomidae in this context) as the body and blood of the war god Huitzilopochtli (Orozco y Berra's edition, 1878, p. 228). A more probable explanation of the attribution of red color to *izcauitli* is that some one, not necessarily Tezozomoc, confused the Nahuatl words *iztatl*, salt, and *eztli*, blood.

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

self? Tell them that I will take vengeance before tomorrow and that they should not dare to give advice about matters which are for me to determine. Let them know that all they have to do is to obey'. Having said this, those who saw assert that the idol looked so ugly and frightful, that all were terrified and frightened. On that very night, it is said, when everything was quiet, a loud noise was heard in part of the camp and when the people rushed there in the morning, they found that all those who had spoken in favor of remaining in this place were dead with their breasts torn open and their hearts torn out. In this way it was that they were taught that most cruel of sacrifices, a custom they always practiced after that, which consisted of cutting open a man's chest in order to tear out his heart and offer it to their idols. (The reason they did that) they claimed was because (their god) ate only hearts.

"Having thus punished them, Huitzilopochtli ordered his priests to tear down the dykes and repairs they had made when they deflected the course of the water to form the lagoon and instructed them to make the river take its former bed. This they did, and the entire lagoon being thus emptied of water the place became as dry as it had been before. When the Mexicans, after some time, saw how sterile the place had become, and realized also that their god was incensed at them, they consulted him, raised their camp, and set out from the neighborhood of Tula in the year 1168 A. D."

– – Radin's translation, 1920, pp. 73–74.

This circumstantial account, alas, cannot be taken as showing that there was an artificial lake at Tula. The more operational suggestion that emerges is that Tula, as understood by Tovar's Aztec informants, was whatever place can be shown to have had an artificial lake. But even this suggestion is hardly worth following up, as the following argument implies.

The "pure" glyph for Tollán (Tula), as it occurs in the Codex Xólotl (Dibble 1951) and the Codex Mendoza (Clark, 1938) consists (Figure 3) of a row of cattails, *Typha* (identified as *Cyperus flavicomus* Michx. by Clark, whose botanical identifications are undocumented and not always reliable). In the *Tira de la peregrinación México* (Anonymous, 1944), commonly known outside Mexico as the Codex Boturini, we have an Aztec pictorial history that is somewhat more influenced by European draughtsmanship; it shows Tula (Figure 2) as cattails in a lake, accompanied by a large-scaled fish that looks remarkably like a carp. Tula is also shown in the pictures that accompany Tovar's *Relación* (the Codex Ramírez, Orozco y Berra's edition, 1944, Lam. II), which, like the text, represent a version of Diego Durán's

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

Historia de las indias de Nueva-España y islas de Tierra Firme, 1579 (Mexico, 1867–80). In this scene the most important glyphic element is the hill with a snake (Coatepec, the hill near Tula). It stands in the middle of lake beset by cattails, in which are swimming a bird, a fish, and a seal, while pollarded trees stand around, each with a bird on top. Two dignitaries are seated at either side, the male with a glyphic name representing a bird and a cactus, while the female is provided with a standard on which is seen an axolotl, rampant, with enormous external gills.

Fig. 2. Contaminated glyph for Tula, as it appears in the *Tira de la peregrinación México* (Codex Boturini) (Anon., 1944).

The implication of this curious inconography is clear and disheartening. The details about the lake of Tula were concocted by native informants to explain the glyph, probably in a manuscript now lost. Later, the pictures were drawn to illustrate the story. The glyph that provoked the story need not have been that of Tollán, for any place with *tules* in its etymology would have sufficed. We must conclude that we do not know whether Tula was situated on an artificial lake, or even whether its name was Tollán.

The hydrographic knowledge of the Aztecs, then, must not be judged by what was told to credulous friars by acculturated Indians fifty years after the Conquest. Cortés' account, though doubtless somewhat colored, has more of the ring of truth. In the famous Second Letter to Charles V, he said:

"Along one of the causeways which lead into the city, there are two conduits of masonry each two paces broad, and five feet deep, through one of which a volume of very good fresh water, the bulk of a man's body, flows into the heart of the city, from which all supply themselves, and drink. The other which is empty brings the water, when they wish to clean the first conduit, for, while one is being cleaned, the water flows through the other" (MacNutt edition, vol. 1, p. 262). Again, describing one of Montezuma's lesser palaces, he said: "It had ten pools of water, in which were kept all the many and divers breeds of waterfowl found in these parts, all domesticated; for the sea-birds, too, there were pools of salt water, and, for those of the rivers and lakes, there was fresh water, which for the sake of cleanliness, they renewed at certain times by means of pipes. To each kind of bird they gave the food which suited its habits in its free state, so that to those which ate fish they gave it; and likewise, worms, maize, and smaller

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

seeds were supplied as required by the different birds. I assure Your Highness that all those birds which ate only fish received each day two hundred and fifty pounds, caught in the salt lakes." (*ibid.*, pp. 265–266).

Such a people could surely have dammed a stream to make an artificial lake, and if they cannot be proved to have done so at Tula, the point is probably not very important.

ICONOGRAPHY AND CARTOGRAPHY. The suggestion that the elaborately "historical" description of Tula was a pure invention, prompted by the cattails of the glyph, shows how wary we must be of inferring Aztec ideas from the pictorial manuscripts. Water and aquatic elements are widely scattered through the existing texts, but there is no necessary limnologic significance in the fact, for the symbol for water, *atl*, came to stand for the vowel-sound *a*, and a glyph that seems to the naive eye to show a lacustrine scene is usually nothing but a condensed rebus for a word in which *a* occurs (Peñafiel, 1885). However, the fact remains that Aztec hieroglyphics were caught at a stage in the evolution of syllabic writing in which the rebus is unusually representational, and the iconography itself is not without limnologic interest.

Rands (1955) has discussed Mesoamerican water symbolism in comprehensive fashion, though without particular emphasis on Aztec culture, and has discerned an extraordinary uniformity in diversity. The widespread distribution of sympathetic or imitative magic produces a high degree of constancy, in the art of all peoples, of certain aquatic connotations: rain, growing things, aquatic animals, clouds, liquids produced from various parts of the human body, etc. What Rands has shown is more surprising, a high degree of iconographic constancy, such that the same pictorial symbols (e. g. the columnar-wavy depiction of falling water) recur, in widely different styles and contexts in painting and sculpture from Maya, Mixtec, and Toltec cultures. Of particular importance for our area is the demonstration that Aztec water symbolism descends directly and with little change from Classic times, as represented by the murals of Teotihuacán.

The most satisfactory Aztec representations of water are the glyphs for place-names, because these can be read. Some of the more interesting are illustrated in Figure 3, redrawn by Martha Dimock from Clark's (1938) edition of the Codex Mendoza. The fact that this is a post-Conquest document raises legitimate doubts about the authenticity of some of its Spanish glosses, but the glyphs themselves are surely faithful versions of prototypes in lost Aztec manuscripts. The basis of this confidence is the fundamental similarity between these pictures and those in the Mixtec codices from southern Mexico, which are certainly

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

chilacaxtli = *Azolla* sp.", and *Tequixquiac* (3G), "saltpeter water", all contain the idea of a lake as well as the sound for water, and all are shown in section. The ideology behind the glyphs was undoubtedly formed before the Aztecs entered the Valley of Mexico, during their wanderings through semi-arid country where streams are of vital importance and lakes are small and astatic. Moreover, the glyph for flowing water is a horizontal waterfall, and is the widespread and ancient Mesoamerican columnar stream, (Rands, 1955), rotated 90 degrees. It is probably no accident that streams are shown as something to be crossed, while lakes are thought of as bodies of water with definite boundaries and *containing* useful objects.

The remaining glyphs of Figure 4 require little comment. *Tamazolan* (3I), "toad", is perfectly clear, and Sahagún gives this as the meaning, but Clark interprets it as "frog". *Iztatlán* (3J), "near the salt", is a salt-pan, with *tlantli*, teeth, showing the place-name ending, while *Iztacalco* (3K), "salt house", is literally that: an earthen *pila* serving as a filtration apparatus in which the clear salt water is collected before being placed in the evaporation basin shown at the top. *Ayotlán* (3L), "turtle", is obviously a freshwater species, probably *Kinosternon hirtipes*, though Clark's interpretation ("a captured turtle on its back") shows confusion with the marine *Chelone*, whose name was *chimalmichin* ("shield fish"). *Tollán* (3M), "cattails", has been discussed in the previous section.

If the Aztecs commonly thought of lakes edge-on, so to speak, they were perfectly capable of showing them in plan. For cartographic purposes it would be essential to show a bird's-eye view, and there are many indications that Aztec cartography was well developed (Linné, 1948). No certain examples have survived, unless we except the famous "maguey plan" (Toussaint *et al.*, 1938) that shows part of the city of Tenochtitlán. This map is not on maguey paper, as Maudslay (1910) and many others have believed, but on native paper made of *Ficus* bark (Lenz, 1948), and unpublished work by D. Robertson suggests that it is in fact a pre-Conquest document on which later elements, such as churches, have been superimposed. Whether pre-Conquest or not, it shows the lake of Mexico only by implication, as empty space off the edge of the city. The Codex Xólotl, an early but not pre-Conquest Texcocan pictographic manuscript, clearly shows the Valley lakes with a string of mountains overlooking them, but not in a way suggesting that a map was intended. The nearest equivalent to an Aztec map of a lake is probably the "Aztlán" picture in the Codex Boturini, reproduced in Figure 4. In fact, since the two earliest European maps of the lake of Mexico (in the 1524 Nuremberg edition of Cortés' Letters

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

and in the 1556 Ramusio edition of the "Anonymous Conqueror") are obviously imaginary, it may be said that the Boturini picture is possibly the oldest surviving map of a New World lake, and it is ironic that we cannot say what lake it represents. 127 823

About this famous picture all that can be said with confidence is that it shows a lake with an island. The island is universally identified as *Aztlán*, the legendary home of the Aztecs, yet the glyph at the top 127 212 823

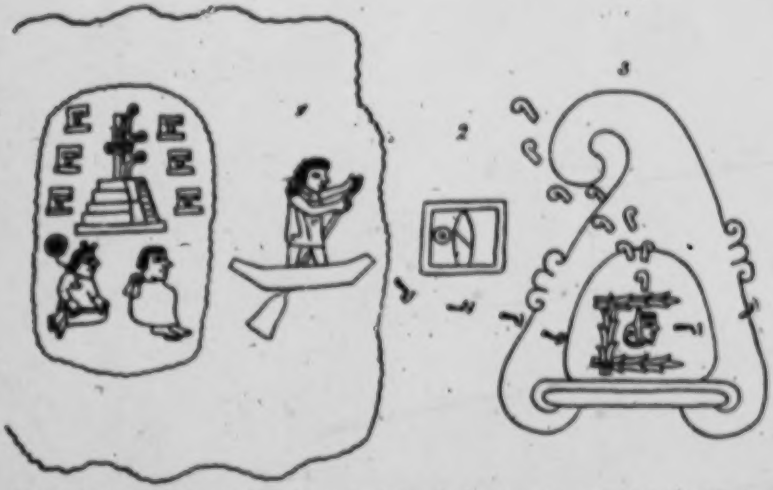


Fig. 4. Origin of the Aztecs, from the *Tira de la peregrinación México* (Codex Boturini). The town, here labelled *Aacatl*, but identified by authorities as *Aztlán*, is situated on an island in a lake, presumably in western Mexico.

designates it as *Aacatl* (*atl*, water + *acatl*, reed). *Aacatl* turns up on a later page as a personal name, and it may indeed be the name of the male figure at the right of the island, for he is otherwise nameless, though his female companion is named *Matlalin*, from *matlatl*, a fish-net. It would be idle sport to list all the places that Aztlán is supposed to have been; Orozco y Berra (1880, p. 66–68) considered it to be the island of Mexcalli in Lake Chapala, while Seler (n.d.) rejected all the legendary wanderings of the Aztecs in western Mexico and brought Aztlán, full circle, back to the Valley of Mexico itself. Escalona (1943) argues with some plausibility for the lake of Metztitlán, in Hidalgo, while Rendón (1948), with even greater plausibility, prefers the lake at the headwaters of the Río Lerma, just west of the Valley. The truth is that the Aztlán part of the Aztecs' history appears full-blown in the circle of Jesuit histories stemming from the Dominican Durán, while 127

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

the Franciscan version, as embodied for example in Sahagún, makes no mention of it. Since some of the "sources" place the Aztecs on Lake Pátzcuaro at one stage of their wanderings, it is amusing, in this work that started from limnologic experience on that lake, to consider that Aztlán may have been the island of Janicho. Certainly the possibility cannot be dismissed that Pátzcuaro was in the mind of the acculturated artist who drew the picture.

If Aztlán had no more reality than the artificial lake at Tula, the delightful possibility arises that the name *Aztec* itself is a chimaera. Clark (1938) actually takes this position, and it is true that the inhabitants of Tenochtitlán were Tenochca, the speakers of Nahuatl were Nahua, and we are left with *Aztec* as a book-name that is conveniently applied to a culture. Barlow (1945) accepted the tradition, found in most of the post-Conquest sources, that the Aztecs changed their name to Mexica when they learned to worship Huitzilopochtli, and he therefore preferred "Empire of the Culhua Mexica" to "Aztec Empire" for the political unit of the late 15th and early 16th centuries. What is reasonably clear is that the etymology of the name was a late invention. The basis of the name *Aztlán*, which means "near the [place of the] egret", was probably a glyph containing an egret, or an egret-feather ornament. Doubtless it was through some long-forgotten pun that the name came to be associated with the word *Aztec*. Remembering that the pun need not have arisen in the Nahuatl language, but could have been in Mixtec, we can hardly hope to recover the ultimate ancestry of Aztec culture from etymology, particularly when the supposed sources so obviously confuse the derivation of words with the derivation of peoples.

But if we cannot prove that the Aztecs sprang from an island in a lake, we cannot deny that that is where they lived and died. The remarkable people who harvested salt-flies and practiced water-bug husbandry, who piped fresh water and farmed salt, and who thought of lakes in profile, had ample reason to associate themselves with egrets.

MICHOACAN

In marked contrast to the wealth of 16th-century source material on the Valley of Mexico, information on the lake district of Michoacán is scanty. The province was relatively fortunate in its 17th-century chroniclers, but by the time these men came to write their histories there was little native culture left to write about. The Tarascan civilization was evidently as well developed as the Aztec; comparative material on ceremonials and customs is given, though briefly, by Sahagún, and

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

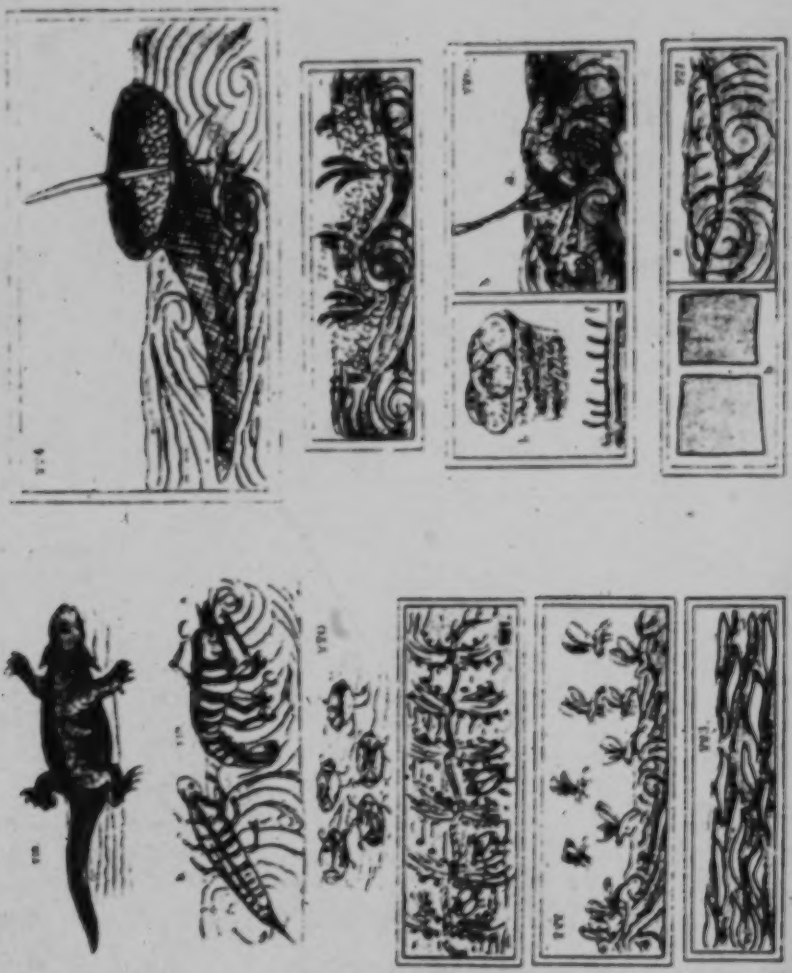
Plate I.

Nos. 218–227 from the Codex Florentino (Sahagún, 1905–07), illustrating parts of Book Eleven "Of the properties of animals, birds, fishes, trees, herbs, flowers, metals, and rocks, and of colors". No. 218, the first figure of the axolotl, *Amblystoma mexicanum;* No. 219, *a*, the crayfish, *acocili; b*, a dytiscid larva, presumably the *ocuiliztac;* Fig. 220, the first figure of a corixid waterbug, the *axayácatl, Abaeatles mexicana* de la Ilave (?=*Krisouiacorixa azteca* Jaczewski); 221, the *axayácatl* laying its eggs (*ahuautli*) on a cultch of reeds; No. 222, presumed to be Odonata and identified as *anenextli;* No. 223, presumed to be the ephydrid larvae (*Ephydra bioni* Say) with which the *izcauitli* is identified; Nos. 224–225, presumably the harvesting of *cuculin* (not mentioned in Sahagún's text), identified as probably ephydrid pupae; Nos. 226–227, possibly continuing the subject matter of the previous two pictures, or perhaps depicting the harvest and manufacture of the algal cake *tecuitlatl.*

[end plate I a]

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

127
136
222



[End plate I b]

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

● 127
212

Plate II.

Top: No. 75 from the Codex Nuttall (Nuttall, 1902), a pre-Conquest Mixtec pictorial manuscript on deerhide, depicting (according to Vaillant, 1941) "warriors attacking a town in a lake".

Below: No. 36 from the Codex Nuttall, possibly depicting two lacustrine scenes, but more probably to be interpreted as place names containing "lake" or "water" in their etymologies. The pictures at the right are surely some sort of rebus containing "water" as in the Aztec system. Note, in the "water" symbol, that all the waves bear jewels, while the shells (with viscera) are shown in midstream. Compare the Aztec *Atocolco* (Fig. 4, B).

[End plate II a]

10:Deevey N-4 (no date)1957 NU7 Aztec NU7

127
212

[End plate II b]

12: Radin E-4 (no date) 1925 NU7 Aztec NU7
Maya NV4

MAYA, NAHUATL, AND TARASCAN KINSHIP TERMS

By PAUL RADIN

A
122
●127

THE MAYA, Nahuatl, and Tarascan kinship terms presented below were extracted from the works of Spanish authors, as the citations will show. This work was financially supported by the New York Academy of Sciences.

Maya Kinship Terms[1]

M
601

yum. Father.
naa. Mother.

*zucum. Father's father.
*mam. Mother's father.
mim. Father's mother.
chich. Mother's mother.

*zucum. Older brother.
cic. Older sister.
ich. Uterine sibling.

ɔeyún. Father's brother.
ixcit. Father's sister.
acan. Mother's brother.
ɔena. Mother's sister.

caazucum. Male cousin.
caacic. Female cousin.

icham. Husband.

*haau. Wife's father.
nohyum. Husband's father.
ixhaan. Wife's mother.
nohcó. Husband's mother.

mú. Spouse's brother.
bal. Wife's brother.

hachil. Child's parents-in-law.

*mehen. Son, man's brother's child.
irmehen. Daughter.

i. Son's child.
abil. Daughter's child.
*ɪɔin. Son's son.
*mam. Daughter's son.

*ɪɔin. Younger brother.
*ɪɔin. Younger sister.

*mehen. Brother's child.
*mehen. Woman's sister's child.
achak. Sister's child.
al. Woman's brother's daughter.

*mam. Father's brother's child.

atan. Wife.

*haan. Son-in-law.
ilib. Daughter-in-law.

haauan. Woman's sister-in-law.

---

* Indicates that the term is used elsewhere in the system.
[1] From Beltrán, Arte del Idioma Maya, 1742.